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To investigate the value of an educational investment for farmers and the community, a study was initiated to examine the relationships between costs and benefits. An instructional program in farm business and resource management from 1959-65 was considered as the educational investment, and benefits were assessed by examining 3,518 business records of enrolled farmers. A benefit-cost analysis revealed: (1) A farmer can expect to realize about $4 of labor earnings for each dollar of investment in educational programs in farm business and resource management, (2)Where the benefits to the community were calculated as an aggregate rise in farm labor earnings and the cost included the aggregate cost borne by the community the ratio was approximately 2:1; where the cost included farm sales as a measure of business activity the ratio was 9:1, (3) Diminishing marginal return effects were observable in educational investments, (4) Over the 6-year period the cost effectiveness of the educational program was not constant, and (5) A rigorous, highly structured, and goal directed educational program in farm business management proved to be an excellent educational investment for the communities in this study. This report is a summary of VT 004 315. (DM)

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"Investments in Education for Farmers"

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INVESTMENTS IN EDUCATION FOR FARMERS,

Summary of an Economic Study of the Investment Effects of Education in Agriculture.

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Research Report

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The authors express appreciation to the Department of Agricultural Economics of the University of Minnesota and to the vocational-agriculture farm business record analysis centers of the area vocational-technical schools for permitting access to the farm business record analyses upon which the study is based.

FOREWORD

This study is one in a series of pioneering efforts to determine more precisely the outcomes of education. More specifically, it is an effort to describe the relationships between educational inputs and economic outcomes.

While the study is highly specific with reference to an adult education program in agriculture, it has relevance to the total field of education. It has special significance at this time when the benefit-cost ratios in educational endeavor are being raised for examination. In a way this study is a "natural" since it utilizes a source of data not heretofore available for researchers in agricultural education.

The authors of this report are to be commended for the new knowledge they have added to the field. As always, when one question is answered, several more spring up. In this frame of reference, this study might well lay a claim to having a part in the knowledge explosion about which so much is said these days.

In any event, the results of this piece of research deserve the very special attention of all those responsible for conducting, planning, supervising and administering educational programs, particularly in the field of vocational-technical education.

Milo J. Peterson, Chairman
Department of Agricultural Education
University of Minnesota

HIGH LIGHTS OF THE REPORT

This research inquiry investigated the degree to which an educational investment is worthwhile for farmers in pursuit of individual and family goals and to the community in which such education is conducted. It examined the relationships among costs, benefits, and the time scale over which costs would be incurred and benefits derived. The educational investment was represented by an instructional program in farm business and resource management. Benefits were assessed by examining 3,518 business records of farmers who were enrolled in farm business management education in vocational-agriculture departments of Minnesota public schools from 1959-1965.

This inquiry was among the first, if not the first, to include a calculation of benefit-cost analysis of education for self-employed adults. A brief listing of its conclusions and implications follows:

1. In a benefit-cost analysis in which all direct and opportunity costs are calculated, and where all future benefits are discounted to present value, a farmer can expect to realize about four dollars of labor earnings for each dollar of investment in the educational programs described in this inquiry. This benefit-cost ratio of 4:1 does not include benefits or returns which are non-monetary.

2. In a benefit-cost analysis in which the benefits to the community are calculated as the aggregate rise in farm labor earnings and where the costs include the aggregate costs borne by the community, the benefit-cost ratio is approximately 2:1. This is an excessively conservative estimate since it does not include as benefits the in-

crease in business activity which derives from expanded farm sales, nor does it include a community benefit which derives from an expanding tax base. A benefit-cost ratio which includes farm sales as a measure of business activity is 9:1. Inclusion of measures of increased tax base or other less tangible monetary benefits result in an even greater benefit-cost ratio.

3. An important aspect of the study was a determination of whether the educational investment demonstrated the economic phenomenon of a diminishing marginal return effect over a given time scale. A time scale of eight years, the arbitrary period over which all benefit-cost ratios were calculated, was used. In the first three years of management instruction, there were rapid gains in farm income which derived from the adaptation of modern technology. Diminishing marginal returns occurred as farmers reached practical ceilings to their capacity to employ technological improvements on existing enterprise combinations. During the fourth and fifth years of instruction, farmers reorganized and reallocated their productive resources to revised enterprise combinations. From the sixth to the eighth year of instruction, farm income increased sharply and dramatically and continued to rise at a steady rate in the remaining two years reported in this study. The conclusions and implications from this information are that diminishing marginal return effects are observable in educational investments but that <u>these effects may also be manageable</u>.

4. With an instruction program in which the benefit-cost ratio is higher than 1, the plotted curve of marginal returns becomes, in effect, an expression of the psychological phenomenon known as the learning curve. The response to education curve accelerates rapidly, declines to a plateau and again rises sharply as continued educational investments are made. The response curves may be manageable since they depend upon the variables which affect the learning situation. Increasing the intensity of the initial three years of instruction and providing similar instruction in the years which follow may increase the initial response to educational investment and reduce the time span during which declines in response may occur.

5. This study, as with all similar inquiries involving benefit-cost analysis, sought to answer the following questions: Does it pay? For whom? Under what conditions? The results indicate that no agricultural community can afford to be without an educational input that will yield as high a return on the investment as is demonstrated in this analysis. As shown in Items 1 and 2 above, the return is high to both the individual participant and to the community. But the conditions are rigorous; the return is based upon a highly-structured educational program. The educational program

must be goal directed and the enrolled participants must have a high degree of "goals consciousness." This study was rigorous in its definition of a "well-organized"* educational program.

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* See Page 12 for the definition of "well-organized."

INVESTMENTS IN EDUCATION FOR FARMERS

Introduction

Agriculture has provided a superior model to illustrate the value of research, the consequences of technological innovation, and the drama of accelerating output per worker. Agriculture in the aggregate, however, contains elements of an economic paradox. The industry has grown rapidly while individual farmers have not shared proportionately in the industry's growing wealth.

Farm operators have been quick to respond to the apparent needs of the industry by making sharp adjustments in the deployment of their resources. Operators now on farms are witnessing a marked increase in the substitutions between physical and human inputs. The proportion of total resource input which is allotted to the broad categories of land, labor, and capital is also changing. As the quantity of available land becomes fixed and competition from off-farm employment reduces the available labor sources, capital is deployed more freely as a substitute for the other two resources in scarce supply.

Substitution of larger amounts of capital clearly increases the problems of capital management, but it does not make the management of land and labor any less important to the successful operation of the farm business.

To depend wholly upon the adaptation of new technological processes or substitutes for human labor to improve the farm operator's economic plight ignores the contribution to income that may be made by management. Each major decision that the farm operator makes has an economic consequence. The value of technology and mechanization to the farm business is limited by the ability of the farm operator to choose the alternative courses of action best suited to his unique resource combinations. Adaptation of a particular set of packaged technology that has proven highly profitable for one farmer may result in minimum or even negative gains when selected by another farmer whose profile of resource allocation is appreciably different.

The decision-making process generally follows a pattern of (a) examining the current situation, (b) setting goals for family and farm, (c) examining the alternative decisions or plans that may lead toward accomplishment of goals, (d) choosing among the alternatives, (e) implementing the decision, and (f) evaluating the outcomes of the decision. Coping with the complexities of modern farm businesses requires that farm operators be well trained in this decision-making process. Further, it demands that they understand the economic consequences of their decisions.

Emphasis on improved farm management ability is neither new to agriculture nor innovative in vocational education. Since the decision-making process begins with an assessment of the current situation, programs that were designed to develop historical data on the farm business can be thought of as early efforts in farm management education. In Minnesota, the initial effort was made by the Department of Agricultural Economics.

While initially the collection of farm business data was not primarily aimed at helping the individual farm operator in selecting alternatives for management decisions, the potential use of the farmer's own business record for that purpose soon became evident.

Beginning several decades ago, a farm business record summarization process was developed by the Department of Agricultural Economics at the University of Minnesota. It provided the farm cooperator with summary data that could be used to examine his current business situation as preparation for pending management decisions and as a means for evaluating previously implemented decisions. The usefulness of this management tool was recognized by farmers and instructors in the Institutional-on-Farm Training Programs conducted under PL 894, PL 550, PL 16, and PL 346 following World War II and the Korean conflict. Studies were made by the Department of Agricultural Education at the University of Minnesota to test the feasibility of using the business management emphasis in adult farmer education in the public school program of vocational agriculture. Encouraging results from these early studies coupled with the successful implementation of a number of pilot programs led to widespread adaptation of a curriculum emphasis employing a farm management-business analysis orientation.

Adaptation of electronic computer technology to the farm business record summary improved the usefulness of the farm record as a management guide by speeding the record analysis procedure. Some pilot studies have also been made to determine the usefulness of various patterns of combining individual rec-

ords for compiling data that may have application to specific types of farms (i.e., dairy farms, cattle feeder operations, cash crop farms, etc.). Work is now underway to improve and expand the analysis system so that it can be more effectively used as a teaching and management tool.

Currently, there are about sixty-five public high schools in Minnesota that employ special instructors for farm business management for farm operators. In addition, many other schools provide adult farm management instruction as an integral part of the total vocational-agriculture program. A typical pattern of operation for a school with one full-time adult instructor includes forty to sixty farmers enrolled in farm management education courses plus additional offerings emphasizing mechanized agriculture or farm production enterprises.

The farm management program consists of at least three and usually four distinct and separate classes. The courses are commonly titled "Farm Records and Accounts," "Farm Business Analysis," "Farm Organization," and "Advanced Farm Management." While course content may vary somewhat from school to school, the usual program will meet the following criteria:

1. There are regularly enrolled students in each course.
2. The course follows a systematic course of study with specific units taught as a part of each course.
3. The three (or four) year course follows a planned curricular pattern.
4. There should be continuity between courses with progression toward farm business reorganization, increased operating efficiency or other objectives which may be consistent with farm family goals.
5. On-farm instruction is an integral and systematically-organized part of the instructional program.

Individualized on-farm instruction is an essential element of an effective program. Successful teachers generally consider it necessary to meet with the farm family six or more times during the year in order to provide continuity of instruction and meaningful adaptation of classroom materials to unique farm situations. An ideal situation provides monthly on-farm instructional visits to farm families in their first year in the program; for second, third and subsequent years of enrollment, on-farm instruction may be slightly reduced. Frequency of visitation will depend upon the needs of the individual farm family. Many farm operators will demand more, rather than less, on-farm instruction as they make progress in the program.

Study of Economic Returns to Investments in Education

It was within the framework of the farm business management education programs conducted by the public schools through vocational-agriculture departments that the question of the precise returns to investment in education for farmers was first examined.

The decision to implement a program of farm business management education through the vocational-agriculture department of a public school should emerge from consideration of the probable tangible and intangible returns that will accrue to the individuals enrolled and also to the community which provides the setting as well as funds for program support. When estimates of the returns to these public and private sectors have been made, they must then be compared to the returns from alternative educational investments. The alternatives which offer the greatest return in tangible and intangible benefits should be given the highest priority in the allocation of educational resources.

Few educational programs provide a basis for determining the tangible benefits of instruction. Farm business management education is a unique example. Enrollment is contingent upon agreement by the farm family to keep an accurate and complete farm business record. Returns to education for those contemplating enrollment in a farm business management education program are roughly predictable from an examination of the recorded evidence of returns to recently-enrolled cooperators in the educational program.

Examination of returns to farm business management education provides an evaluation of the following questions:

1. What return can a farm operator expect from enrollment in a farm business management program in the local high school?

2. Does the return diminish with succeeding increments of instruction so that continuing investment in education for an individual reaches a point where it is no longer profitable?

3. Does the total benefit to the community exceed the community costs of program implementation and support?

To provide answers to these questions, researchers turned to the records of those who had been enrolled in vocational-agriculture farm business management education programs since 1959. Extreme care was taken to insure that the confidential nature of the record was not violated. Code numbers, rather than names, were assigned to all records to protect the identity of the individual farm record during the analysis of data. A total of 3,518 records were examined.

Any study of economic return is hampered by fluctuations that occur in price levels and general economic activity. Economic growth or change is frequently measured in terms of

"constant dollars," a term that denotes a unit of buying power rather than monetary denomination. The techniques for computing the "constant dollar" may vary.

In this study the effects of price level variations and other economic factors were minimized by calculating index values for the measures of economic returns. The average financial success of farm operators whose farm records were analyzed for the first time in a particular year was arbitrarily assigned an index value of 100. Within the same year, the average success of farm operators whose records were analyzed for the second, third, or subsequent year was assigned an index value relative to the performance of the group whose records were analyzed for the first time. This technique is illustrated in Table 1 for the labor earnings reported in records analyzed in 1965.

Table 1. MEANS AND INDICES OF FARM RECORD$ ANALYZED IN 1965

	Years Analyzed				
	1	2	3	4	5
Mean Labor Earnings	$4,026	$5,429	$6,501	$5,326	$6,170
Labor Earnings Index	100	135	161	132	153

The example shows that the labor earnings of those whose records were analyzed for the second year were 135 per cent of those analyzed the first year. In periods of adverse prices or weather or adverse changes in the business cycle, there may have been low earnings in the initial analysis year. The 1962 analysis year is presented in Table 2 as an example.

An increase in labor earnings of $865 for farmers in the third analysis year results in an index of 130, while in 1965 (See Table 1), it required an increase of $1,200 to produce a similar index. Thus, the index system of examining the success of the farm business for a particular year is a reasonably accurate assessment of the financial success of farm operators with different farm record histories relative to those with no effective farm management instruction. The effects of some of the factors over which an operator has no control, but which cause wide variation in a farm operator's income from year to year, have been nullified in the computation of an index. Thus, the effect of farm business management instruction may be presented more objectively.

Table 2. MEANS AND INDICES OF FARM RECORDS ANALYZED IN 1962

	Years Analyzed				
	1	2	3	4	5
Mean Labor Earnings	$2,903	$3,234	$3,768	$3,769	$3,009
Labor Earnings Index	100	111	130	130	104

Results of Other Studies of Returns to Adult Education

Dr. John Rolloff, a former Minnesota vocational-agriculture instructor, developed and tested a model for determining the influence of the farm business analysis phase of instruction in farm management upon factors of economic efficiency and understanding of economic principles of management.[1]

[1] Rolloff, John A. "The Development of a Model Design to Assess Instruction in Terms of Economic Returns and the Understanding of Economic Principles." Unpublished Ph.D. dissertation, The Ohio State University, Columbus, 1966.

He used McCormick's test of basic profit maximizing principles as one measure of educational output.[2] To determine the measures of economic efficiency, Rolloff used two criteria: (1) the variables regularly used as measures of farm business management efficiency, and (2) the variables which were judged significant by experts.[3] The selected variables were gross income, net cash income, net farm income, net worth, net margin, operating ratio, overhead ratio, gross income per $1,000 invested, net farm income per $1,000 invested, gross income per man equivalent, and productive man work units per man equivalent.

Using the first-year farm record as a base, measurements of changes in economic efficiency from year to year were made. The procedure assumed that the first year of instruction did not contribute to the managerial efficiency. Measures of earnings in the second year were adjusted for changes in economic and weather conditions by a correction factor based upon data from the Economic Research Service of the United States Department of Agriculture.

Rolloff used three criteria to select educational input variables: the inputs were regularly computed by teachers of vocational agriculture for state reports, the inputs were judged by experts as potent variables, and the inputs logically could be assigned a standardized monetary value per unit.

The local vocational-agriculture instructors were asked to report the contact hours (class time, farm management con-

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2 McCormick, Floyd G. "Developing a Procedure for Evaluating Farm Understanding of Basic Profit Maximizing Principles." Ph.D. dissertation, The Ohio State University, 1964.

3 Rolloff, "The Development of a Model Design to ...," p. 43.

sultation at the school and on-farm instruction time). Through a time assessment procedure, he found the number of instructional hours and assigned a charge of $5 per unit based on reimbursement rates for vocational education in Ohio.

Rolloff concluded by presenting a positive mean dollar ratio of 1 to 52.16 between the 1965 costs of instruction and change in farm income between 1964 and 1965.

The model Rolloff presented was a contribution to the analysis of individual economic returns from instruction in farm business management. Because of the limits of his cost calculations, however, the significance of the results for individual or community decision making was rather limited.

Cvancara investigated the direction and degree to which measures of farm production responded to educational investments in Minnesota. He studied two groups of farmers. Members of group A were enrolled in the Minnesota adult farm management education program in 1960, 1961, and 1962; those in group B received farm management instruction only during 1962. Thirty-three farm pairs were obtained by matching farms in group A with farms in group B on the basis of 1962 data: farm size (measured in work units), the combination of livestock and crop enterprises, and soil, climate, and topographical factors.

By comparing input costs of farm management instruction to the value of the output as measured by the average increases in cash income for group A versus group B in 1960 and 1961, Cvancara was able to determine the economic returns to investment in education. Group A farms increased their income $558.89 over group B farmers. He projected these returns by taking 50 farm units times $558.89 yielding $27,944.50 as the increase in cash income

due to farm management instruction by one full-time vocational-agriculture instructor.

Cvancara studied the direction and relative magnitude of the cash-income-increase advantages of group A. Group A had an increase of $1,179 (1961 vs. 1960) compared to a group B increase of $403 per farm unit. By extending the procedure to 1962 vs. 1961 data, he showed that group A increased $927 compared to $1,629 for group B. He concluded that group B farms had the potential of increasing farm income and raised the question as to whether increases in farm income attributed to farm business management instruction might be subject to the diminishing returns effect.

Interpreting the Evaluation of the Farm Management Program

Because the nature of the educational input varied from school to school, there was a need to distinguish programs which were expected to provide more intensive educational inputs. These schools were designated as "well-organized" programs after meeting the following criteria:

1. The classes were taught by full-time instructors who had responsibility only for the adult program.
2. The programs were judged excellent by a panel of experts who considered two primary measures:
   a. The classes were oriented toward farm business management topics.
   b. The classes had a high degree of continuity.

Statistical procedures in the study report a measure of the accuracy of each analysis and, therefore, indicate the degree of confidence leading to generalizations or conclusions from the data. One common indicator, R^2, is called the coefficient of

determination. This measure describes the proportion of the variation in one variable that is accountable to variation in other variables. For example, if the R^2 value of the relationship between labor earnings and cumulative years of instruction was .50, one half of the variation in labor earnings can be accounted for by variation in cumulative years of instruction. If the variables used for prediction of income accounted for all the variability in labor earnings, the R^2 would have a value of 1.00.

Most of the R^2 values in this study were in the range of .20 to .80.

Expected Returns to Instruction

"Well-organized" programs of farm business management instruction represent intensive, continuous investments under the guidance of a full-time instructor. Some communities may wish to initiate farm business management programs with only one-quarter to one-half time of one instructor devoted to the program. The "well-organized" programs have been used as a basis for explaining the relationship of education to farm income to permit schools to estimate the returns they may expect to accrue from a limited program. It is assumed that program organization and emphasis would be similar to "well-organized" programs even though the number of participants would be limited.

One of the primary purposes of this study was to determine whether the economic returns to adult farm business management were subject to the diminishing marginal returns effect. To study the nature of the changes in labor earnings, return to capital and family labor, and total farm sales, it was neces-

sary to use statistical methods involving the use of curvilinear, or polynomial, equations. The equation which best described the relationship between years of participation measured by the number of farm business records analyzed and the various measures of economic returns are represented by diagrams in the material which follows.

Labor Earnings

Labor earnings should reflect the true return to operator's labor and management while compensating for differences in supply of family labor and capital investment. Cvancara's study[4] suggested the hypothesis that labor earnings would exhibit the diminishing marginal return effect with additional educational investments.

Figure 1 illustrates the relationship between mean labor earnings and participation in farm business management education based upon farm families enrolled in "well-organized" programs conducted by full-time instructors. The mean value for the first year was $3,000. The value increased to nearly $4,000 in the second year and over $4,000 by the third year. After the third year, the values dropped but were still above the starting value of $3,000. The value in the sixth year was about $3,200 but then began increasing at an accelerated rate. By the tenth year, the mean labor earnings was up to $10,500. As the R^2 of .510 in Figure 1 shows, half the variance in labor earnings was accounted for by the number of years enrolled in farm business management education.

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4 Cvancara, Joseph G. "Input-Output Relationships Among Selected Intellectual Investments in Agriculture." Ph.D. Thesis, University of Minnesota, Minneapolis, 1964.

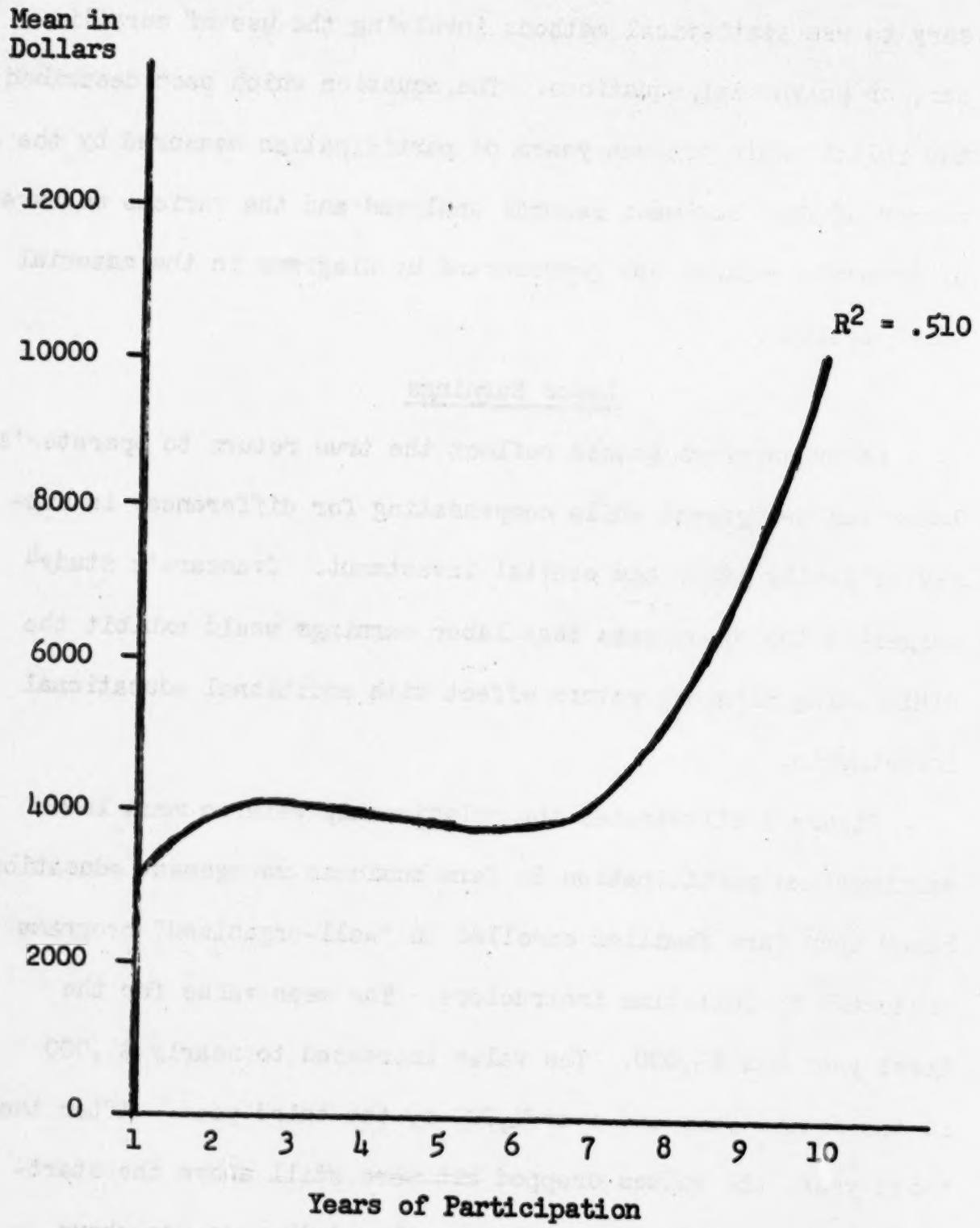

Figure 1. RELATIONSHIP BETWEEN MEAN LABOR EARNINGS AND ADULT FARM BUSINESS MANAGEMENT EDUCATION[a/]

a/ Based upon farmers enrolled in "well-organized" adult programs conducted by full-time instructors.

It was hypothesized that a plot of indexed mean labor earnings for participants in "well-organized" programs would be very similar to Figure 1. As Figure 2 illustrates, the fluctuation is more pronounced than in Figure 1. In the first year, the indexed mean value is close to 100.[5] The second and third years show increases to almost 140. After the third year, the values gradually decrease to a minimum of about 110 in the seventh year. After the seventh year, the values increased sharply until by the tenth year the indexed mean labor earnings were about 2.4 times as great as the indexed values for the first year. The proportion of the variance accounted for by regression was about the same as in Figure 1; an R^2 of .404 was calculated for Figure 2.

It is possible that vocational educators may be alarmed with the apparent decline in economic response to increments of education during the fourth, fifth, and sixth years of farm business management education. The decline in expected labor earnings following the third year of instruction must be viewed in relation to the emphasis on improvement in the farm business organization and the natural temporary disruption of the profit-producing capacity of the farm business as adjustments are made in the deployment of resources.

The initial changes made in farm business management as a result of management instruction and application of farm busi-ess analysis information are those which provide increased

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[5] While first-year record averages were arbitrarily assigned a value of 100, the mathematical equation which describes the relationship of the variables shows the best-fitting line for the entire continuum of educational investment to be slightly less than 100 for the first year.

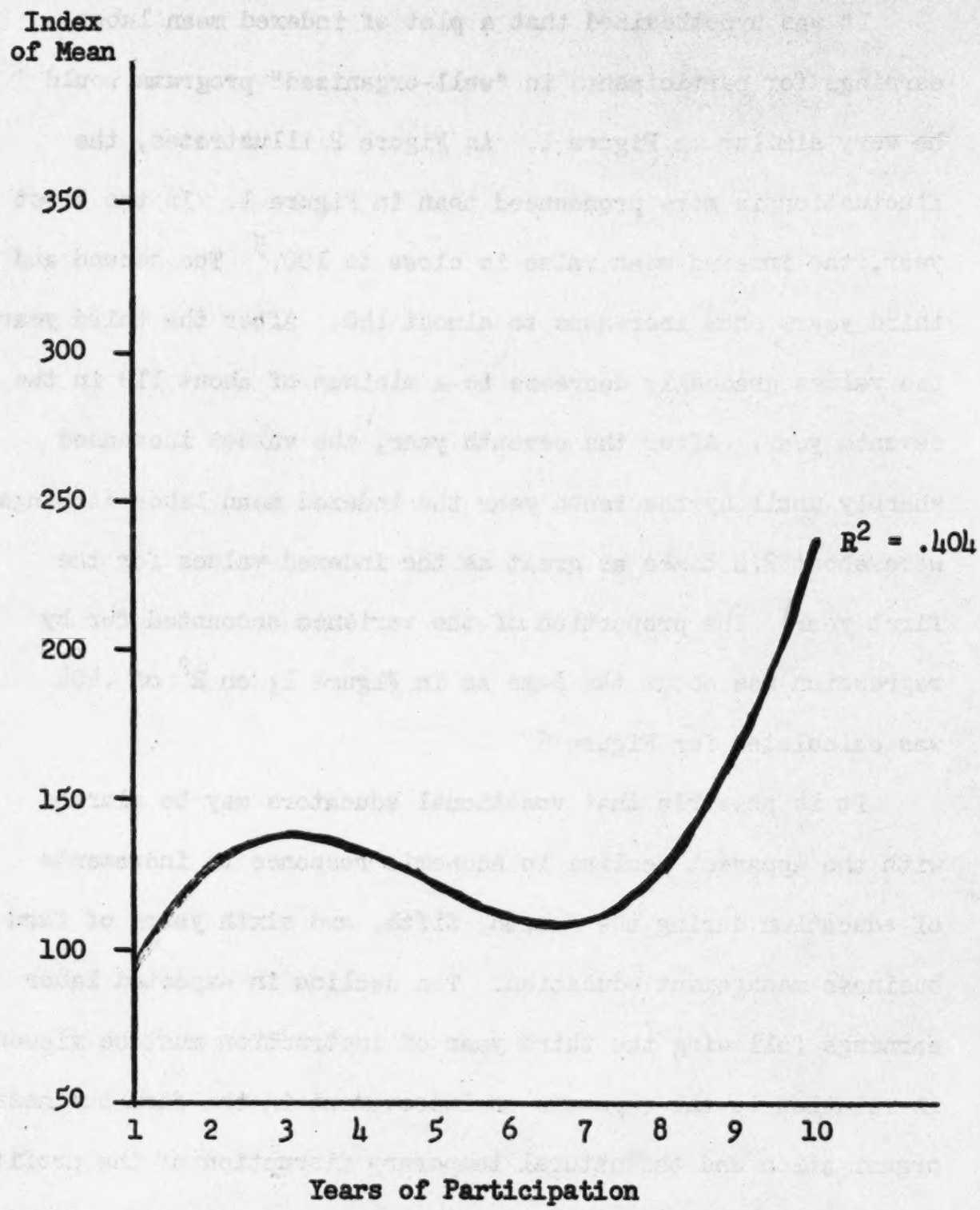

Figure 2. RELATIONSHIP BETWEEN INDEXED MEAN LABOR EARNINGS AND ADULT FARM BUSINESS MANAGEMENT EDUCATION[a/]

[a/] Based upon farmers enrolled in "well-organized" adult programs conducted by full-time instructors.

profits without major reallocation of resources. The obvious improvements in such things as rations for livestock, improved crop cultivation practices and chemical weed control make large initial contributions to farm income. The diminishing marginal return effect, however, places practical ceilings on farm earnings by adaptations of this kind of technology. Further improvement in income capacity requires examination of the allocation of resources and the reorganization of vital production inputs.

Revisions in a farm business organization may be expected to cause a temporary disruption in the profit-producing mechanisms of the farm business. Even a revision in resource allocation which resulted in expansion of an enterprise would necessitate adaptation of technology on a larger scale than previously practiced and would at the same time be accompanied by expansion in capital investments. Response from such changes is often delayed as adjustments are made in business operation. At the same time, the operator becomes more skilled in management of the new or expanded enterprise. The rapid increase in earnings following the adjustment period is a natural response to expanded business capacity and improved management skills.

The discussion of return to capital and family labor and total farm sales, which follows, reinforces the assumptions made in describing the response of earnings to educational investment.

Return to Capital and Family Labor

Since labor earnings and return to capital and family labor are both measures of farm income, it might be expected

that the general form of the relationship between mean return to capital and family labor and years of participation in farm business management education would be similar to that for labor earnings.

Figure 3 shows that the mean values of return to capital and family labor do not show an initial increase as did labor earnings in Figure 1. The first-year value was about $5,250. This figure decreased slightly in the second and third years. In the fourth year, the mean return to capital accelerated sharply. By the tenth year, the expected value was over $16,250. This marginal return represented an increase of approximately $11,000 over the value reported for the first year. Figure 3 shows that the farm business management education accounted for 22.9 per cent of the variance in return to capital and family labor.

It was assumed that the index of the mean return to capital and family labor for participants in "well-organized" programs would vary in much the same fashion as did the mean values reported in Figure 3. However, as Figure 4 shows, the best-fitting relationship between education and income was a straight line. The straight-line relationships started at an index value of approximately 80 in the first year and went to an index value of over 210 in the tenth year. The low R^2, .143, reduces the usefulness of this equation in predicting farm earnings.

Total Farm Sales

Because it has an effect not only on economic returns to the farmer but also to the community, total farm sales was an

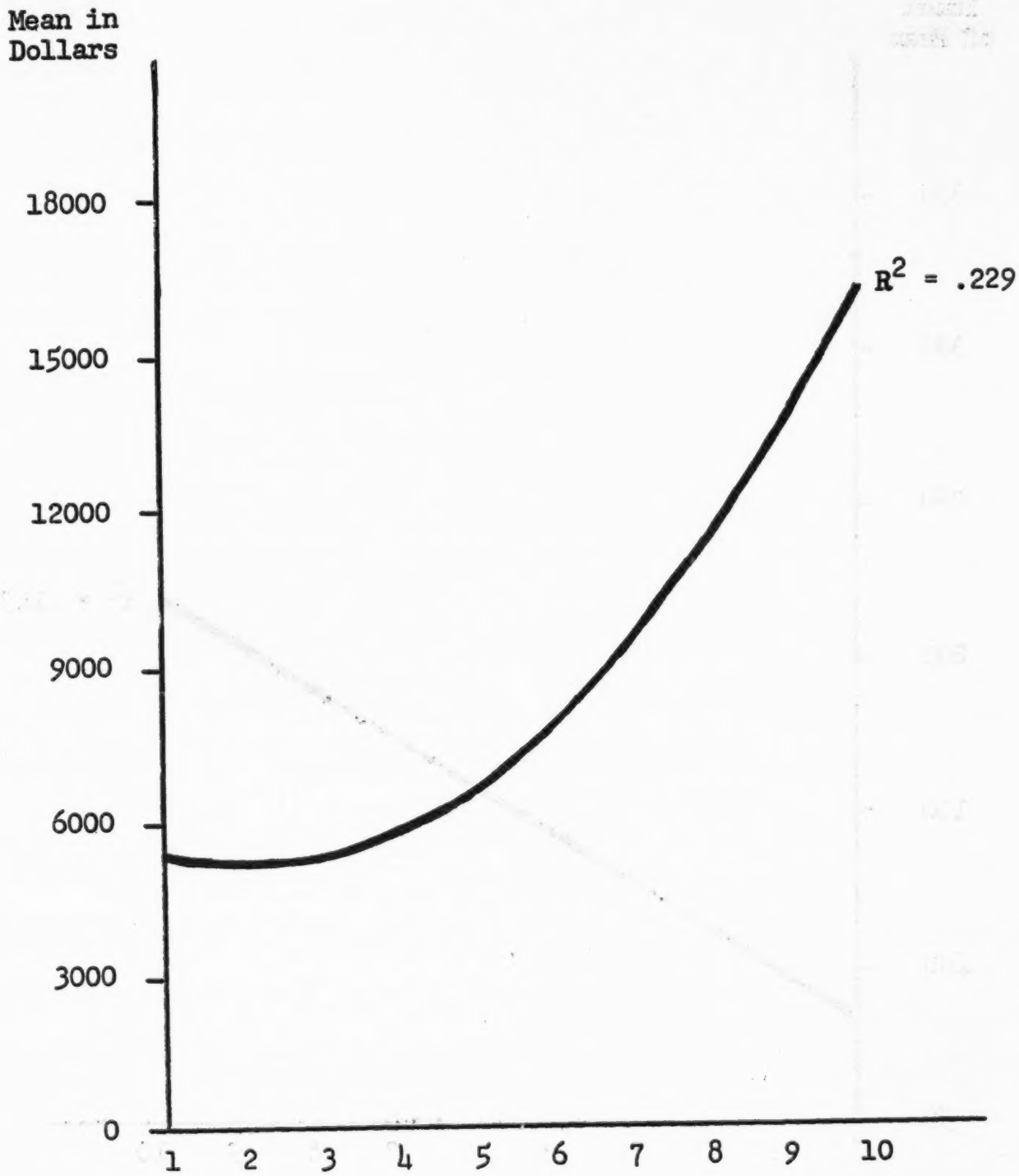

Figure 3. RELATIONSHIP BETWEEN MEAN RETURN TO CAPITAL AND FAMILY LABOR AND ADULT FARM BUSINESS MANAGEMENT EDUCATION[a/]

a/ Based upon farmers enrolled in "well-organized" adult programs conducted by full-time instructors.

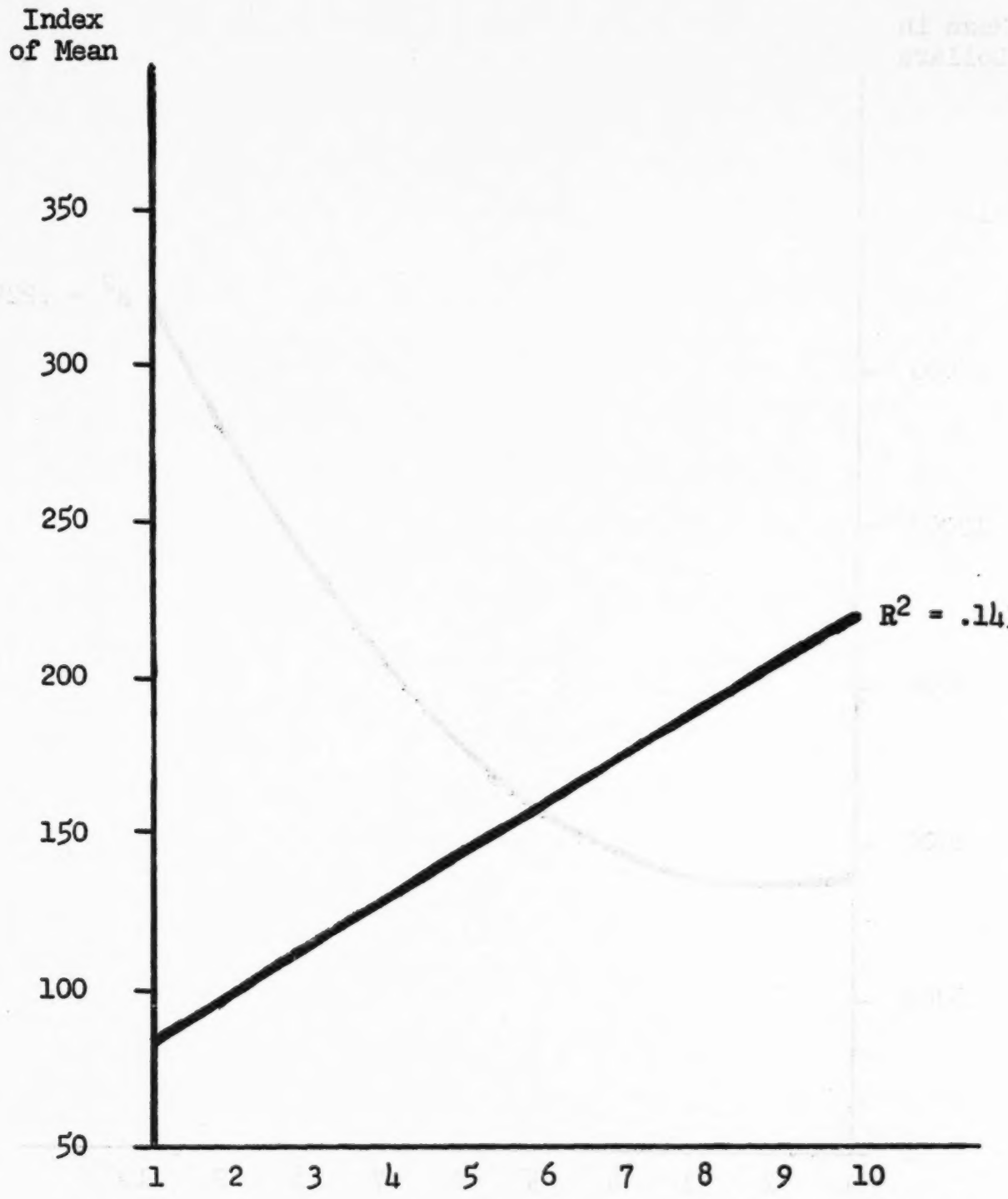

Figure 4. RELATIONSHIP BETWEEN INDEXED MEAN RETURN TO CAPITAL AND FAMILY LABOR AND ADULT FARM BUSINESS MANAGEMENT EDUCATION[a/]

a/ Based upon farmers enrolled in "well-organized" adult programs conducted by full-time instructors.

important measure of returns to investments in the adult farm business management education program. With Cvancara's study of income as the basis for expectation, a diminishing marginal returns effect was anticipated in mean total farm sales for farmers in "well-organized" programs.

The graph in Figure 5 reports an increase in mean sales from $19,000 to $21,000 in the first three years. Years three, four, and five have nearly the same value, but it increases at a sharply increasing rate with subsequent increments of educational investment. After ten years, the mean value was almost $67,000. This was $48,000 more than the mean sales for the first year. There was a strong relationship between farm sales and education as indicated by the R^2 value of .721.

It was expected that if the relationship between the index of mean total farm sales and years of participation were plotted for farmers in "well-organized" programs, the resulting graph would be similar to the graph of mean total farm sales. Starting at an index of 105, Figure 6 shows the value of the index of total farm sales to be about 120 after two years and then to level off until the sixth year. The index of mean sales increased at an accelerated rate after the sixth year. With accuracy relatively high, as suggested by the R^2 of .679, the value of the index of total farm sales after ten years of instruction is more than 3.85 times the value computed in the first year.

Decision to Participate

A rational decision to enroll in farm management education classes is based upon the relationship of expected benefits to the expected costs. Farmers ask the inevitable question, "Does

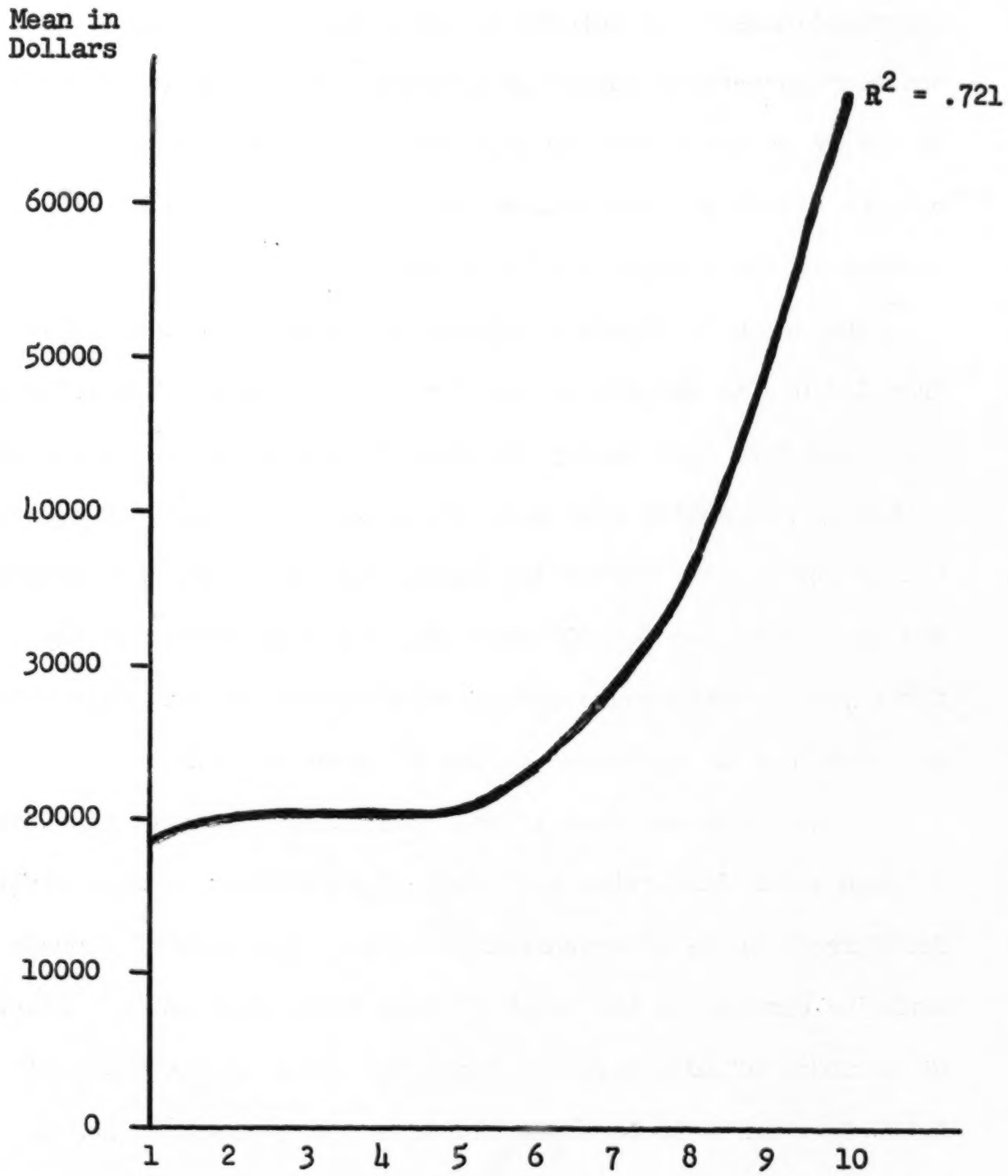

Figure 5. RELATIONSHIP BETWEEN MEAN TOTAL FARM SALES AND ADULT FARM MANAGEMENT EDUCATION[a/]

a/ Based upon farmers enrolled in "well-organized" adult programs conducted by full-time instructors.

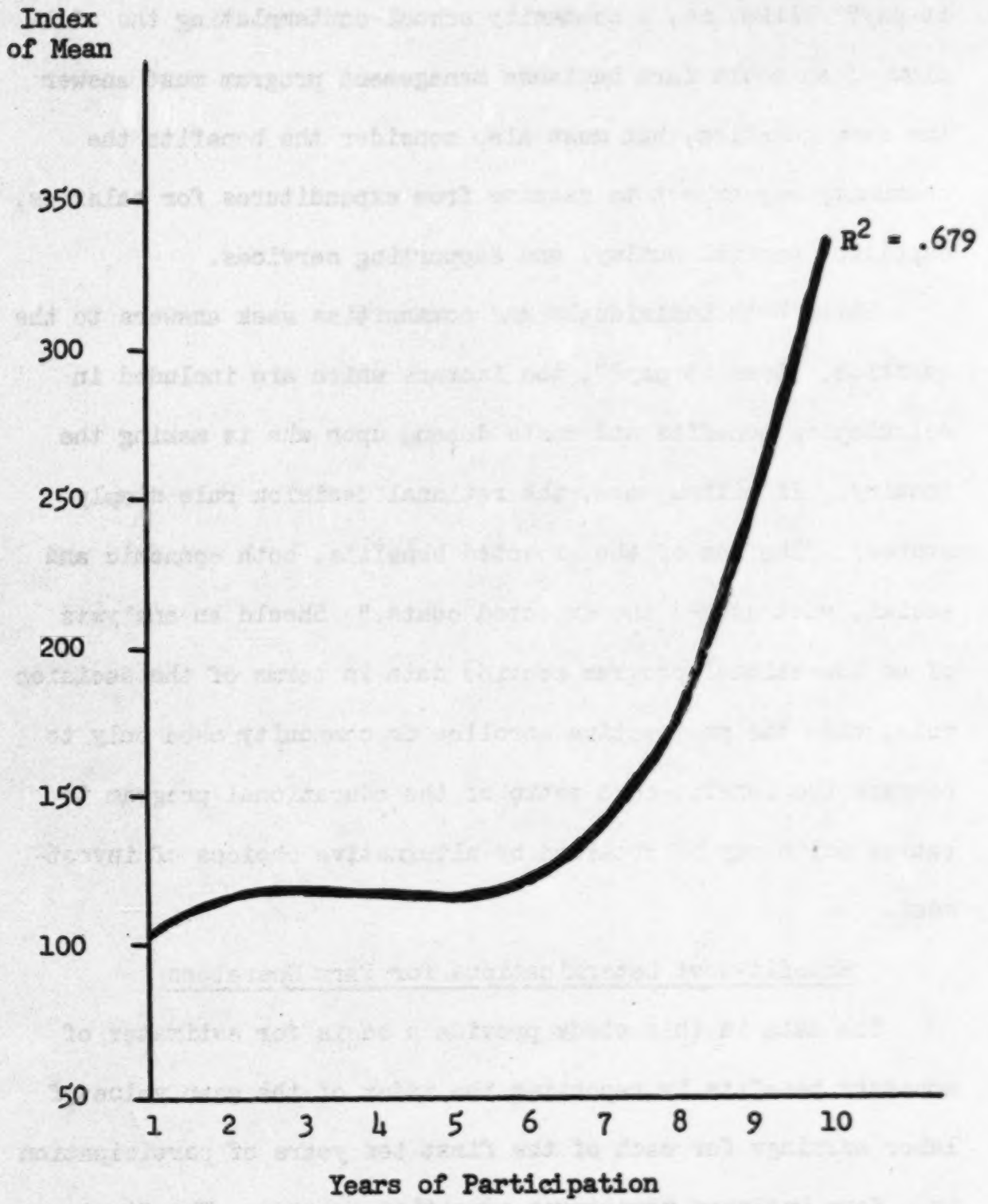

Figure 6. RELATIONSHIP BETWEEN INDEXED MEAN TOTAL FARM SALES AND ADULT FARM MANAGEMENT EDUCATION[a/]

[a/] Based upon farmers enrolled in "well-organized" adult programs conducted by full-time instructors.

it pay?" Likewise, a community school contemplating the addition of an adult farm business management program must answer the same question, but must also consider the benefits the community may expect to receive from expenditures for salaries, supplies, capital outlay, and supporting services.

While both individuals and communities seek answers to the question, "Does it pay?", the factors which are included in calculating benefits and costs depend upon who is making the inquiry. In either case, the rational decision rule simply states: "The sum of the expected benefits, both economic and social, must exceed the expected costs." Should an analysis of an educational program provide data in terms of the decision rule, then the prospective enrollee or community need only to compare the benefit-cost ratio of the educational program to ratios which may be obtained by alternative choices of investment.

Benefit-Cost Determinations for Farm Operators

The data in this study provide a basis for estimates of monetary benefits by reporting the index of the mean value of labor earnings for each of the first ten years of participation in a farm business management education program. The first eight years have been arbitrarily chosen to illustrate the benefit-cost ratio obtained in farm business management programs. To convert the indexed values (which were reported in Figure 2) to dollar figures, the weighted average labor earnings ($3,000)[6] of farmers who had their first record analyzed was multiplied by the index value. Columns (b) and (c) in Table 3 show the

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[6] See Figure 1.

indexed and the dollar values of expected labor earnings for each of the eight years of instruction.

Table 3. DISCOUNTED BENEFITS OF EDUCATION TO FARM FAMILIES ENROLLED IN "WELL-ORGANIZED" FARM BUSINESS MANAGEMENT EDUCATION PROGRAMS BASED UPON LABOR EARNINGS ADJUSTED FOR TAXES

(a)	(b)	(c)	(d)	(e)	(f)
Years of Participation	Index[a]	Dollar Value Using $3,000	Marginal Return Over Base Year	Marginal Return After Tax[b]	Discounted Marginal Benefit
1	.97	2,910	$ ----	$ ----	$ ----
2	1.30	3,900	990	806	704
3	1.40	4,200	1,290	1,049	856
4	1.35	4,050	1,140	927	707
5	1.23	3,690	780	636	453
6	1.12	3,360	450	368	245
7	1.10	3,300	390	320	199
8	1.25	3,750	840	684	398
		Sums	$5,880	$4,790	$3,562

[a] Based on the statistical estimates of points on the curve in Figure 2, page 16.

[b] Tax adjustments based on 1967 Internal Revenue instructions for filing individual tax returns with allowance for five dependents.

In this study benefits that may have accrued to the average farm family during their initial enrollment year were not considered as being due to farm management instruction. Total program benefits were calculated as the sum of differences between the labor earnings reported by farmers with two, three or suc-

ceeding years of instruction in comparison to earnings of farmers who were analyzing a farm business record for the very first time. The sum of the marginal returns over the base first-year records for the first eight years of instruction was $5,880.

Marginal returns over the base year had to be adjusted for the effects of income tax to provide a true measure of spendable income. Income tax adjustments were made using the accrual method. Because the data showed the average farm family to number 5.12 people, tax adjustments were completed based on 1967 Internal Revenue instructions for filing individual tax returns with an allowance for five dependents. Adjustments were made in taxable income to allow for non-cash expenses used in calculating labor earnings. The sum of the tax-adjusted marginal returns to investments in farm management education for an average farm family was $4,790.

Expected future returns are reduced to their present value by a procedure called discounting. The present value of future income depends on the interest rate, the expected returns, and the number of years before the return is collected. For example, a farm family who might expect $634 in marginal spendable income five years hence could have the same return by investing $453 now at seven per cent interest for five years. The total present value of benefits for eight consecutive years of participation in farm business management education was $3,562 for the average farm family.

Costs to the Farmer

Since both benefits and costs are components of the decision rule, it is necessary for farmers to have an accurate es-

timate of the costs associated with farm business management education. There are two types of individual costs: opportunity costs and direct costs.

Opportunity cost is the approximate value of the farm operator's labor if he were doing productive work rather than participating in the education program. Study data showed an average farmer's working time was worth about two dollars per hour.

Most "well-organized" programs of farm business management education have two different levels of intensity. The first three years involve high intensity instruction; the subsequent five years have less intense instruction. For purposes of illustration, researchers assumed the average farm family enrolled in one of the first three years of intensive instruction received twelve on-farm instructional visits, attended three group meetings, and went to ten evening classes per year.

Group meetings are defined as meetings of special interest to two or more cooperators. They are generally held during the working day. Attendance is usually restricted to farmers enrolled in the farm management education program. Group meetings are often conducted on the farm of one of the participants and may include tours, field days, and special farm clinics for farm management education cooperators.

Evening classes refer to instructional meetings held for a specific farm management education class. The purpose of this form of instruction is to discuss applied economic principles, new farm technology, or business management procedures that are applicable to all farmers enrolled in the class.

Attendance is limited to those regularly enrolled. Both farm cooperators and their wives are encouraged to participate in the evening class sessions. Meetings generally last for two to three hours and are scheduled to meet once each month during the entire year.

It was estimated that a minimum of two hours was invested in each of the classes, group meetings, and on-farm instructional visits. In addition to time investments in class meetings and on-farm instruction, it was estimated that a farmer spent about eight additional hours keeping the detailed farm records needed for analysis than he would otherwise have used to keep minimum accounts for income tax purposes. The opportunity cost for evening class hours was reduced to half the normal rate of two dollars since leisure time was sacrificed instead of work time.

Table 4. DISCOUNTED COSTS OF FARMERS ENROLLED IN "WELL-ORGANIZED" FARM MANAGEMENT EDUCATION PROGRAMS

(a) Years of Participation	(b) Opportunity Costs	(c) Direct Costs	(d) Total Costs	(e) Discounted Costs
1	$96	$64	$160	$150
2	96	64	160	140
3	96	64	160	131
4	52	46	98	75
5	52	46	98	70
6	52	46	98	65
7	52	46	98	61
8	52	46	98	57
			Total Discounted Costs	$849

The last five years of instruction involved different time investments than the first three years. It was assumed that farmers enrolled during this period received six on-farm instruction visits, utilized eight hours keeping additional farm record data, and attended six evening class sessions. Column (b) in Table 4 reports the total opportunity costs for each of the eight years.

In addition to opportunity costs, individuals incurred direct costs by participating in the farm management education program. These costs included $25 for each farm business record analysis, $3 for miscellaneous class purchases, $3 transportation expense for each evening class attended and $2 transportation expense for each group meeting. Direct costs dropped from $64 to $46 in the fourth year as reported in column (c), Table 4, due to a lower intensity of instruction in the last five years.

The total estimated costs incurred by a farm family were discounted using the same interest rate and procedure as for program benefits. The total discounted costs for participating in a farm business management education program for eight consecutive years were $849.

The Farmer's Benefit-Cost Ratio

Once one knows the expected benefits and the expected costs, he has the necessary information to make a rational decision. The benefit-cost ratio is the present value of future benefits (from Table 3) divided by the present value of future costs (from Table 4). The benefit-cost ratio for this study was 4.20.

$$\frac{\text{Future Benefits } \$3,562}{\text{Future Costs } \quad 849} = \$4.20$$

FOR EACH DOLLAR INVESTED BY A FARMER IN THE FARM BUSINESS MANAGEMENT EDUCATION PROGRAM, HE RECEIVED A RETURN OF $4.20.

Although the individual benefit-cost ratio was calculated with the assumption that there would be no benefits in the first year, other studies have shown that an economic return can be expected to occur in the first year. Cvancara's study showed a farmer could expect returns to instruction during the initial year even though the farm business record analysis was not yet available. Therefore, the actual benefits from program participation are probably greater than the conservative estimates used in this study.

While a true accounting of benefits from education must include social and aesthetic values derived from the educational experience, these non-tangible benefits cannot be easily determined. To simplify the calculations of benefits from the educational investment, all intangible returns were left unexamined in the computations of individual benefits.

Since this study included all the costs a farmer would incur by participating in farm business management education and since it used conservative estimates of the benefits, the benefit-cost determination tended to underestimate rather than overestimate the benefit-to-cost ratio.

Determining Benefit-Cost Ratios for the Community

Labor Earnings -

A Farm Business Management Education Program would normally enroll about fifty farm families. Some would be enrolled in their initial year while others may have already had two or more

years of previous instruction. The total enrollment would consist of families who had a wide range of previous instruction. Experience has shown that a few families drop out as they become more highly skilled in decision making. Others may drop out as they develop "record keeping fatigue." A distribution of farm families with various enrollment histories is shown in Table 5. Such an enrollment pattern permits a new class of ten cooperators to be started each year and thus conforms closely to the enrollment pattern experienced in some existing farm business management programs.

Table 5. COMMUNITY BENEFITS FROM FARM BUSINESS MANAGEMENT EDUCATION PROGRAM FOR FIFTY-ONE FAMILIES[a/]

Years Enrolled	No. of Farmers	Marginal Labor Earnings per Farmer	Total Marginal Labor Earnings[b/]
1	10	$ ----	$ ----
2	9	990	8,910
3	9	1,290	11,610
4	7	1,140	7,980
5	5	780	3,900
6	4	450	1,800
7	4	390	1,560
8	3	840	2,520
	51		$38,280

a/ Based on labor earnings.

b/ Total discounted benefits for eight-year period are $247,411 using same discounting procedure and interest rule as was used for computation of individual benefits.

The decision to initiate a farm management education program in a community is based on the same decision rule as that used by the farm family; the sum of the benefits must exceed the sum of the costs. The community, however, has several costs not included by individual farm families. Thus, the procedure for computing the benefit-cost ratio for the community is more complex.

Total economic benefits to the community can be computed by including the sum of the benefits to the individuals enrolled. The economic benefits in this study were calculated using the individual returns shown in Table 3 with class members distributed in management education experience categories as shown in Table 5. For example, ten members in the first year of instruction were assumed to have no marginal benefit from farm business management instruction; nine members in the second year of instruction were expected to have a marginal labor earnings of $990 each. The total class enrollment of fifty-one students would expect $38,280 to accrue each year as a result of instruction in farm business management. Calculation of these benefits is shown in Table 5.

Because communities stand to benefit from all income, including that spent for taxes, the community return was based on gross marginal return rather than net return after taxes. When labor earnings were used as the measure of economic return, the annual total community benefit was $38,280. A decision to establish a farm business education program has long-range effects. To measure the benefits over an extended period, benefits have been discounted for an eight-year period. The same procedure for discounting was used as previously applied to individual

benefits. The total present value of the benefits that might be expected to accrue to a community over an eight-year period from farm business management education is $247,411. This sum includes only additional labor earnings to farm operators as a result of instruction and ignores the additional business activity generated by increases in farm sales and the multiplier effect of new expenditures.

Total community costs include those borne both by individuals enrolled and the community school which sponsors the educational program. Costs can be readily divided into four categories:

1. Opportunity Costs of Individuals Enrolled -

   This study assumes that the opportunity costs for the community are equal to the sum of the opportunity costs for individuals enrolled. Opportunity costs discounted for eight years for a class enrollment of fifty-one cooperators equals $25,202.

2. Direct Costs of Individuals Enrolled -

   It was assumed that costs for the community were equal to the sum of the direct costs for individuals enrolled. Discounted direct costs for an eight-year period equalled $18,422.

3. Direct Community Costs -

   Some operating costs were based on data from the Agricultural Education Section, Vocational Division, Minnesota Department of Education; others were derived from estimates of general supporting costs. Summary of these costs is shown in Table 6. Total direct operating costs discounted for an eight-year period equal $74,565.

4. Capital Costs -

   Some capital outlay would be required to provide facilities and equipment for program operation. Table 7 outlines the capital outlay requirements. An annuity rate of .08024 per cent would result in an annual capital cost of $711. This annuity rate would recover capital outlay costs in twenty years with an annual yield of five per cent interest on investment. Total capital cost for the

eight years used in this example would be $5,688. Unlike other costs, capital outlay is not discounted due to the annuity procedure of computation.

Table 6. ANNUAL COMMUNITY SCHOOL OPERATING COSTS FOR A FARM MANAGEMENT PROGRAM EMPLOYING ONE FULL-TIME ADULT INSTRUCTOR

Item	Annual Cost[a]
Salary of Instructor	$ 9,378[b]
Mileage	717[b]
Meals & Lodging While Traveling	150[b]
Janitorial Service (½ hr./day for 250 days @ $2/hr.)	250
Secretarial Assistance (1/10 time @ $360/month)	432
Teaching Materials, General Office Supply	400
Fuel, Electricity	150
Telephone	60
Total Direct Expense	$11,537

[a] Total discounted direct program costs for an eight-year period are $74,565. The same discounting procedure was used as for computation of benefits.

[b] From data supplied by Agricultural Education Section, Vocational Division, Minnesota State Department of Education; all other costs based on estimates of actual costs.

The procedures for computing community benefit-cost ratio is similar to that for individuals; the sum of the benefits is divided by the sum of the costs. In the case of the community, the sum of individual benefits was discounted over a period of eight years. This total benefit was $247,411. Total costs were also discounted for eight years. The sum of individual opportunity costs ($25,202), individual direct costs ($18,422), community direct operating cost ($74,565), and capital outlay

($5,688) was $123,877. The benefit-cost ratio is computed as follows:

$$\frac{\text{Total Benefits to the Community}}{\text{Total Costs to the Community}} = \frac{\$247,411}{\$123,877} = 1.997$$

FOR EACH DOLLAR THAT THE COMMUNITY SPENDS ON FARM BUSINESS MANAGEMENT EDUCATION, THEY CAN EXPECT TO GENERATE ABOUT TWO DOLLARS IN INCREASED FARM LABOR EARNINGS.

Table 7. CAPITAL OUTLAY FOR FARM BUSINESS MANAGEMENT PROGRAM

Item		Cost
Office (8' x 10' @ $17.24/sq. ft.)[a]		$7,586
Conference Room (12' x 15' @ $17.24/sq. ft.)		
Office Equipment		
Desk & Chair	$176	
Filing Cabinets	204	
Typewriter	200	
Calculator	600	
Portable Adding Machine	100	
Total Office Equipment		1,280
	Total Capital Outlay	$8,866
Yearly Cost of Capital Based Upon Annuity Rate of 20 Years, 5 Per Cent Interest		$711[b]

[a] Average bid price for new school construction, 1966, Minnesota Department of Education.

[b] Total cost of capital outlay for eight-year period equals $5,688.

Farm Sales -

Labor earnings may be an ultraconservative criterion measure of the impact of farm business management education since it fails to account for gross income earned and spent within the community. Community benefits of the educational program

may best be measured by increases in farm sales that can be associated with participation in the farm business management program. Money which accrues to farm families from farm sales is used for operating expenses, family living, debt retirement, savings, and capital investment. Regardless of the way in which this money is used, the community derives benefit from the increased business activity. Table 8 shows the annual increase in farm sales that might be expected to accrue to the fifty-one farm families described in the previous benefit-cost example.

Table 8. MARGINAL FARM SALES ASSOCIATED WITH ENROLLMENT IN FARM BUSINESS MANAGEMENT EDUCATION

Years Enrolled	Number of Farmers	Marginal Farm Sales per Farm[a/]	Total Marginal Farm Sales[b/]
1	10	----	$ ----
2	9	2,660	23,940
3	9	3,230	29,070
4	7	2,850	19,950
5	5	2,660	13,300
6	4	3,800	15,200
7	4	7,220	28,880
8	3	14,440	43,320
	51		$173,660

a/ Based on the statistical estimates of points on the curve in Figure 5, Page 22, and average farm sales reported in first-year record analysis, 1959-1965.

b/ Total discounted benefits for eight years using discounting procedures defined for individual benefits equals $1,122,398.

With farm sales as the criterion measure, the total discounted benefits for an eight-year period of farm business management instruction would be $1,122,398 for a program enrolling fifty-one farm families. The costs would be the same as reported previously, $123,877.

Using these sums in a benefit-cost comparison gives a benefit-cost ratio of 9.06. FOR EACH DOLLAR SPENT OR CHARGED TO FARM BUSINESS MANAGEMENT EDUCATION, THE COMMUNITY COULD EXPECT TO RECEIVE $9.06 IN INCREASED BUSINESS ACTIVITY.

Conclusions and Implications

Data and conclusions reported in this summary are only a portion of those reported in the more extensive work from which they are drawn.

The inquiry was guided by the following questions: What benefits can accrue to farm families who choose to participate in an intensive, goal-oriented, educational program intended to improve their technical competence and management skills? What benefits accrue to the community that chooses to support such a program? What are the benefit-cost ratios of such an educational program when calculated for the individual participant and for the community? What is the educational and the economic relevance of the performance curves which describe the input-output relationships of the educational program outlined in this inquiry? What are the short-term and long-term implications of such a program?

The educational program described in the study is an intensive, continuing course. Participants are engaged in classroom, small group, and individual, on-farm instruction.

Instruction is intended to improve technical competence and entrepreneurial skill. Each participant is required to keep accurate production and expense records and to submit his farm business records for summary and analysis at the close of the fiscal year. As a result of directed study of the business analysis, a farm operator makes changes to maximize his economic return insofar as this will contribute to his individual and family goals. The instructional program upon which this study is based meets rigorous criteria of organization and goal orientation and is described as "well-organized."

The criterion variables for the study are operator's labor earnings (a measure of net income) and total farm sales. All monetary values are weighted to compensate for factors affecting yearly fluctuation in farm income levels. These criterion variables are used to calculate the return to individuals and to the community.

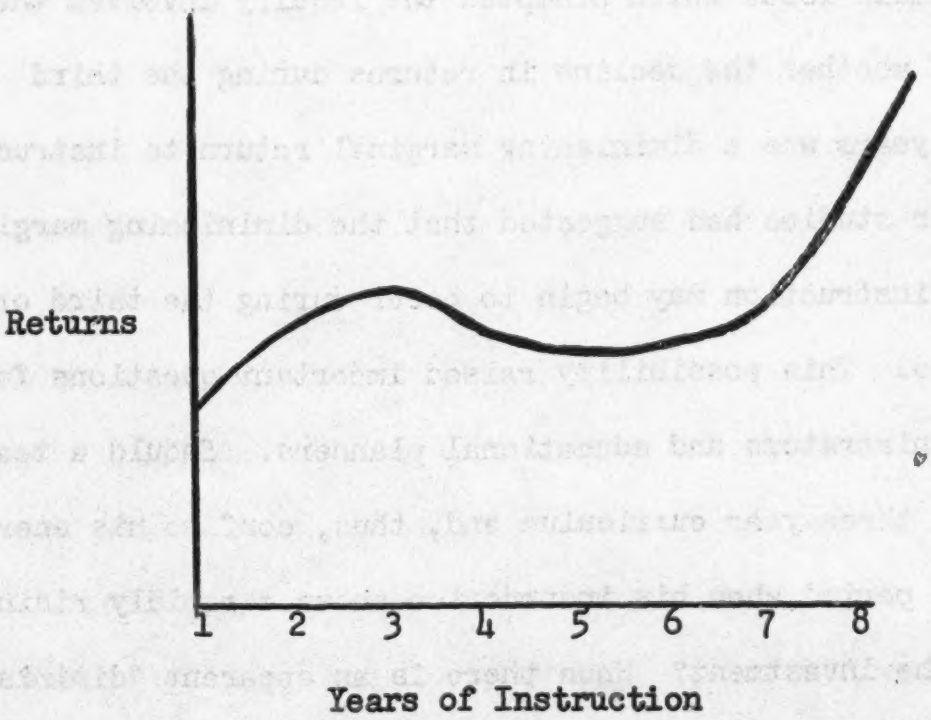
The participants in the study were farmers who were enrolled in farm business management education in vocational-agriculture departments of Minnesota public schools for time periods ranging from one to fourteen years. Each of the participants was self employed; each was responsible for his own managerial decision making.

The choice of farmers as the recipients of the instructional program has some unusual complexities. It is necessary, for example, to have a complete and accurate system of farm accounts to measure economic gains. It is also necessary to have an instructional program that is highly individualized. There are also some unusual advantages in having farmers involved as the

students in the program. Farm income is very responsive to changes in entrepreneurial skill among farm operators. There are few regulatory forces (industry-wide wage contracts, product-pricing mechanisms, etc.) to establish limits within which a farmer may benefit from his ability to manage his productive resources.

The farmers involved in the study did not, however, constitute the sampling unit. The sampling unit was a completely-analyzed annual farm record. In this study, 3,518 farm records were studied. Of these, 1,475 were from programs judged to be "well-organized."

Major conclusions from this study are based upon performance curves calculated from farm business and educational input data. These performance curves were calculated by the technique of curvilinear regression. The performance curves represent the relationship of the criterion variables to the instructional program. The general form of the performance curve for both criterion variables is as shown in the following figure:



The shape of the performance curve shows a rising return to educational input during the first three years, a decline during the fourth and fifth years, and a sharply rising slope beginning with the sixth or seventh year of the instructional program. An increase in return during the first three years may result from modern technologies which are rather easily applied to the existing organization of the farm resources. During the fourth and fifth years, the farmer may respond to instruction by reorganizing his business. He revises his combinations of resources, re-examines his productive capacity and introduces a functional reorganization. The business may be reorganized to accommodate the new levels of efficiency that are available to meet his production goals. The fourth and fifth years, thus, are a period of retooling to maximize the return on available resources. The rise in return beginning with the sixth or seventh year is the response to a more efficient utilization of available resources and a more effective use of entrepreneurial skill.

A specific issue which prompted the inquiry involved the question of whether the decline in returns during the third and fourth years was a diminishing marginal return to instruction. Other studies had suggested that the diminishing marginal returns to instruction may begin to occur during the third or fourth years. This possibility raised important questions for school administrators and educational planners. Should a teacher plan only a three-year curriculum and, thus, confine his energies to the period when his instruction shows a rapidly rising return on the investment? When there is an apparent "diminishing

marginal returns effect," should the teacher begin with an entirely new group of students so that he will always be engaged with instruction which yields an immediate or an early response?

Those who advocate restriction of farm business management education to three or less years will fail to accommodate the increased need for decision making that occurs as part of business reorganization. Failure to provide educational service at this most vital time may deter the farm family from fully utilizing the income production potential that may be derived from careful study and assistance during planning and initiation of resource reorganization.

The "diminishing returns effect," while a practical administrative question, is not subject to precise measurement in this inquiry. For precise analysis, it would be necessary to insure that the increments of educational input are approximately equal over a given time scale. As in most research on educational investment, these increments can only be assumed to be roughly equal throughout the instructional sequence.

An important conclusion is that the return on an educational investment described as the instructional program used in this study is very high. The extent of return is treated in the benefit-cost analysis to be discussed in the later paragraphs of these conclusions.

The existence of a significant return on such an investment was a verification of previous inquiries which had been limited to a shorter time span. A major interest in the present study was the determination of the nature of the return over the

longer period represented by the performance curves. The results show that the return is not uniform over the longer time period but that returns do accrue to those who are persistent in participation. Moreover, the return for this persistence is great. The decline in return during the fourth and fifth years is more a function of the instructional program than a "diminishing return" effect. Since the business often undergoes major changes, instruction to guide reorganization is essential to increased return.

The educational implications of the study are enormous. First of all, the performance curves, which were calculated to ascertain the nature of response to an educational input and to determine the phenomenon of a diminished return, may not necessarily have any relationship to the economic phenomenon of diminishing returns. The performance curves have the same general form which describes the psychological phenomenon known as the learning curve. This curve is positively accelerating at its beginning, becomes negatively accelerating, and, finally, reaches a plateau and the cycle is repeated. The performance curves, like learning curves, may be manageable. They depend on variables which affect the learning situation. It is the function of education to optimize the conditions which will maximize both the amount of learning and its relevance. If the performance curves in the inquiry are an accurate interpretation of learning curve phenomenon, then this study is among the first to describe such a learning curve over an extended time span and also to calculate the curve as an economic return to an investment in instruction. Further inquiries, accordingly, may con-

tribute to learning theory as well as to a knowledge of the instructional variables which affect the economics of education.

Secondly, in addition to the theoretical implications of the performance curves, there are practical educational conclusions. Although this inquiry has dealt with an educational program for self-employed adults, the instructional program is amenable to the efficiencies of modern educational technology. Some of the farm records used as basic information for the study were analyzed using a system of electronic data processing (EDP). The calculation of benefit-cost analysis for the educational program is a demonstration of the use of program planning and budgeting (PPB) systems for community instructional programs. As a form of systems analysis, the PPB system has region-wide applicability to educational programs as well as applicability to individual school programs. The instruction provided to farmers in this inquiry was intensive. Since instruction is sequential and programmatic, it is highly amenable to computer-assisted instruction (CAI). Further efficiencies and, thus, more widespread growth of the instructional program used in this study may result from combinations of the various forms of systems analysis. With additional developmental effort, this is likely to be an outcome of this research.

As mentioned earlier, the extent of the return on the educational investment was verified by a benefit-cost analysis. Benefits included those to the community as well as to the individual. Costs included all indirect costs, including opportunity costs, as well as direct costs. The benefit-cost ratio

for individual participants over the eight-year period was found to be 4.2 to 1. For each dollar invested in the program by the individual, increased return to his labor and management was $4.19.

As a further verification of the benefits of such a program, a benefit-cost ratio was calculated for the community. Community benefit was assumed to be the total of the individual benefits. Since there are numerous community benefits to be derived from an increase in cash flow and an increase in the tax base, using only the aggregate increased return to operator's labor and management underestimates the actual community benefit. The benefit-cost ratio of the program when benefits are measured by increased return to operator labor and management was about 2:1. When farm sales were used in calculating increased business activity, the benefit-cost ratio increased to about 9:1.

Any investment with a benefit-cost ratio similar to that shown for education in farm business management is a valuable holding for the community. As community action groups, boards of education, chambers of commerce, and others seek ways to build affluence in rural communities and protect local economies, farm business management education should be among the high priority alternatives. Minnesota revolves around the agriculture industry. A strong, dynamic and profitable farm business is the rural community's most valuable asset.